

R E M A R K S

Claims 1-27 have been canceled and replaced with new Claims 28-42. New Claim 28 corresponds with Claim 29 as allowed in the parent application USSN 10/281,909, except that the words "substantially unpurified" in respect of the Fischer-Tropsch derived olefinic feedstock that is fed to the hydroformylation stage have been deleted. Basis for the recitations in this claim can also be found at page 3 line 17 running over to page 4 line 27 (for a feedstock comprising linear olefins, branched olefins and non-olefins) of the specification as filed.

New Claim 32 also contains recitations which correspond with recitations in allowed Claim 29 of USSN 10/281,909, except that, as regards the Fischer-Tropsch derived olefinic feedstock to the hydroformylation stage, the qualifications that it is substantially purified and that it contains non-olefins have been deleted. Basis for the recitations in this claim can also be found on page 3 lines 6 to 25 of the specification as filed (as regards the Fischer-Tropsch derived olefinic product comprising linear and branched olefins).

New Claim 36 also contains recitations which correspond with recitations in allowed Claim 29 of USSN 10/281,909, with the following distinctions:

- (a) the qualification that the Fischer-Tropsch derived olefinic feedstock to the hydroformylation stage must be substantially purified has been deleted; and
- (b) the qualification has been added that the Fischer-Tropsch derived olefinic feedstock also comprises non-olefinic components with different functional groups. Basis for the recitations in this claim can also be found on page 3 lines 22/23

of the specification as filed.

New Claim 39 also contains recitations which correspond with recitations in allowed Claim 29 of USSN 10/281,909, but its Fischer-Tropsch derived olefinic feedstock does not contain the qualification that it is substantially unpurified, nor does it contain the qualification that it includes non-olefins. Additionally, it is limited to a hydroformylation catalyst comprising an alkyl phosphine ligand modified cobalt homogeneous catalyst wherein the ligand is 9-phosphabicyclo(4,2,1)nonane or 9-phosphabicyclo(3,3,1)nonane. Basis for the recitations in this claim can also be found in the specification as filed at page 3 lines 6 to 25 (in respect of the Fischer-Tropsch feedstock comprising linear and branched olefins) and on page 9 line 27 running over to page 10 line 3 (as regards the hydroformylation catalyst specified therein).

New Claim 41 also contains recitations which correspond with recitations in allowed Claim 29 of USSN 10/281,909 apart therefrom that, as is the case with new Claim 39, its Fischer-Tropsch derived olefinic feedstock to the hydroformylation stage no longer contains the qualification that it is substantially unpurified, nor does it contain the qualification that it contains non-olefins. However, it contains the limitation that the hydroformylation catalyst is a phosphine ligand modified cobalt homogeneous hydroformylation catalyst, as well as the additional limitation that the hydroformylation temperature of 140°C to 210°C is used. Basis for the recitations in this claim can also be found in the specification as filed at page 3 lines 6 to 25 (as regards the Fischer-Tropsch derived feedstock comprising linear and branched

olefins) and on page 10 lines 19/20 (as regards the hydroformylation temperature specified therein).

The recitations in new Claim 42 correspond with the recitations in Claim 1 as allowed in USSN 10, 281,909. Basis for the recitations in new Claims 29 and 33 can be found on page 3 lines 22/23 of the specification as filed. Basis for new Claims 30, 34, 38 and 40 can be found on page 10 lines 19/20 of the specification as filed. Basis for new Claims 31, 35 and 37 can be found on page 9 line 27 running over to page 10 line 3 of the specification as filed.

In earlier applications from which this application is derived, the Examiner relied on the combination of Bahrmann and Sato to reject the claims on the basis of obviousness. In essence, the Examiner's rejection hinged on the interpretation that Bahrmann discloses that a Fischer-Tropsch derived linear olefinic feedstock is capable of being hydroformylated. Sato was then argued to complete the solution of the problem of hydroformylating such feedstocks, purely because its feedstock contains branched and linear internal and terminal olefinic components.

From page 3 line 28 through page 4 line 4 thereof, Bahrmann recognizes and describes the complexity of a Fischer-Tropsch derived olefinic feedstock. In this paragraph Bahrmann acknowledges the problems of hydroformylating a Fischer-Tropsch derived olefinic feedstock and teaches the skilled person away from believing that such a complex olefinic feedstock can be hydroformylated. Bahrmann then offers the solution of purifying the complex feedstock by distillation and fine

purification to overcome the difficulties in hydroformylating the complex feedstock.

The Examiner then relied on Sato to provide a solution to the known problem of hydroformylating a complex Fischer-Tropsch derived olefinic feedstock. However, as discussed hereinafter, Sato does not teach the hydroformylation of complex feedstocks. The examples in Sato use only two feedstocks. These are:

Feedstock 1: An octene isomer mixture obtained by dimerization of butene

Feedstock 2: Pure 2-methyl-2-butene

Neither of these two feedstocks comes close to addressing the problems which the skilled person, wanting to hydroformylate complex Fischer-Tropsch derived feedstocks, faced prior to the present invention.

Feedstock 2 obviously does not have a complex composition.

Feedstock 1 also does not have a complex composition when compared to a Fischer-Tropsch derived olefin composition. Mixtures of olefinic isomers obtained from the dimerization of butene are well known in the art, and contain a limited variety of linear and branched internal and alpha olefins. A process for dimerization of butenes, eg that used to make the feedstock of Sato, can form a product mixture containing only isomers of an olefin with eight carbon atoms and some unreacted butene. Such product mixtures do not contain unsaturated hydrocarbons of different molecular size, alcohols, ketones, acids, etc as Bahrmann teaches a Fischer-Tropsch derived feedstock to contain. The feedstocks used in the hydroformylation process of

Sato are thus not complex, but rather pure olefin mixtures.

The only other disclosure of the feedstocks which can be utilized in the process of Sato is found from column 2 line 32 to column 3 line 16. Again, the components listed do not represent a complex feedstock. Column 2 line 32 to column 3 line 4 discloses single component feedstocks and not complex oligomerization processes. As already explained for the case of butene dimerization, these product mixtures can similarly not be seen as complex product mixtures when compared to Fischer-Tropsch derived feedstocks.

It is known to the skilled person that the Fischer-Tropsch process produces an extremely complex composition of chemical compounds following a Schultz Flurry product distribution. This is evident from Tables IV and V on pages 186 and 187 of Dry M.E. "The Sasol Fischer-Tropsch process". A copy of this publication was is submitted herewith. Further evidence of the complexity of a Fischer-Tropsch derived feedstock can be found in Table III, p108 of Journal of Chromatography 280 (1983), article entitled "Determination of total oxygenates in Fischer-Tropsch liquid products". A copy of this article is submitted herewith.

Such a Fischer-Tropsch derived olefinic product contains components which are known to interfere with homogeneous catalysis reactions. Examples of such components are conjugated dienes, terminal alkynes, conjugated unsaturated ketones and the like. US 4052477 (copy submitted herewith) illustrates that the presence of such components was known at least as early as 1976, by providing a process for

removal of diolefins from a Fischer-Tropsch olefinic feedstock.

The interfering effect of such components on hydroformylation reactions is also known, as can clearly be seen from a publication by Van Leeuwen et al, "Dormant states of Rhodium hydroformylation catalysts" (copy submitted herewith). From this publication it is clear that the hydroformylation reaction is inhibited by the presence of interfering components present in a complex feedstock.

U.S. 5,520,722 (copy submitted herewith) shows clearly (see, for example, column 6 line 53 to column 7 line 17) the poisoning effect of dienes and alkynes on hydroformylation reactions, and teaches that "There is a great need, however, for a stringent purification of the feed stock, because the activity of the catalyst is strongly inhibited by acetylene and other highly unsaturated hydrocarbons if they are present as impurities in commercial oxo feeds. These components must essentially be removed before hydroformylation" (column 1 lines 42-50).

Significantly, the priority date (filing date) of this disclosure is January 18, 1995, and this reference can thus be considered as defining the state of the art at that time. The priority date of the present application is June 29, 1995. It is thus clear that the present application provides a solution to a significant problem existing in the state of the art as at its priority date.

Contrary to this, such interfering components are not present in the feedstocks disclosed in Sato. The teachings of Sato would thus not lead the skilled person to

believing that a complex composition derived from a Fischer-Tropsch process would be suitable as a hydroformylation feedstock.

Thus, the Applicant has surprisingly found that in spite of the said factors deterring the skilled person from using a complex Fischer-Tropsch derived olefin composition as hydroformylation feedstock, such a feedstock can now be hydroformylated to obtain alcohol and aldehyde products, as claimed in new independent Claims 28, 36 and 42.

From this it is thus clear that Sato does not render it obvious to a person skilled in the art to hydroformylate a complex composition which is derived from Fischer-Tropsch, as the feed composition disclosed by Sato is not complex.

In addition, in order to circumvent the known problems in hydroformylating a Fischer-Tropsch derived olefinic feedstock, Bahrmann teaches a biphasic, heterogeneous hydroformylation process. In this process, the effect of interfering components present in the Fischer-Tropsch derived olefinic feedstock is circumvented by preventing contact between these interfering components and the catalyst.

In the heterogeneous process of Bahrmann, the catalyst is contained in the water phase and is brought into contact with the olefinic feedstock which represents the organic phase, by mixing the two phases into a suspension of small droplets, as described on page 2 lines 27-29 of Bahrmann. The reaction thus occurs at the interface between the organic and water phases, and is mass transfer limited.

Due to the fact that the olefin is present in an excess concentration in the feed, compared to the interfering components, contact between the interfering components and the catalyst is thus kinetically limited. In this manner, Bahrmann avoids the known problems of hydroformylation of a Fischer-Tropsch feedstock. This illustrates the non-obviousness of hydroformylating a Fischer-Tropsch derived olefinic feedstock when using a homogeneous catalyst as claimed in new independent Claims 28, 36 and 42.

As regards independent Claim 32, it too is clearly distinctive over Bahrmann and Sato in a non-obvious fashion, since it is also limited to the use of a phosphine and/or phosphate ligand modified rhodium, cobalt or ruthenium **homogeneous** hydroformylation catalyst. As discussed hereinbefore, Bahrmann clearly teaches the use of a heterogeneous rather than a homogeneous catalyst.

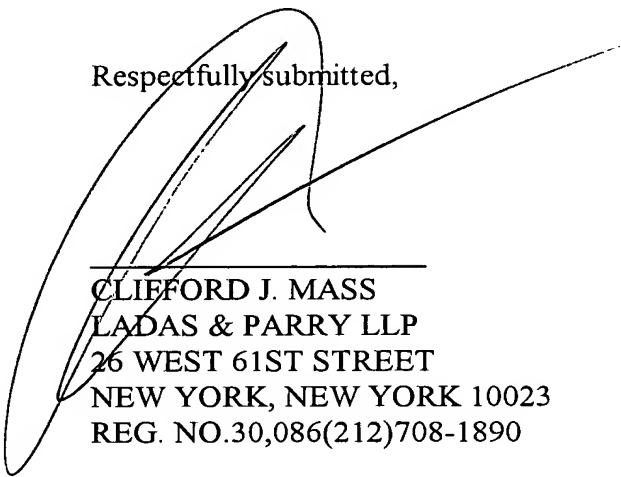
As regards independent Claim 39, it is also clearly distinctive over Bahrmann since it contains the feature that the hydroformylation catalyst is an alkyl phosphine ligand modified cobalt homogeneous catalyst wherein the ligand is 9-phosphabicyclo(4,2,1)nonane or 9-phosphabicyclo(3.3.1)nonane. Bahrmann teaches only the use of water soluble rhodium catalysts.

As regards independent Claim 41, it contains the features that a phosphine ligand modified cobalt homogeneous hydroformylation catalyst is used, and that a hydroformylation temperature of 140°C to 210°C is used. It is thus also clearly distinctive over Bahrmann since, firstly, Bahrmann teaches the use of rhodium

catalysts and, secondly, it teaches a hydroformylation temperature range of 20°C to 150°C.

In view of the above, the new claims submitted herewith are believed patentably to distinguish over the prior art. An early and favorable examination of the application as amended is respectfully requested.

Respectfully submitted,



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